

A DEA and Regression-based Financial Performance Evaluation Framework for Public Bus Transport

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Abstract

This paper proposes a regression and DEA based financial performance evaluation frame work in the context of Kolkata, a metropolitan city of India. Now a day, performance of Kolkata bus transport is affected abysmal financial performance because of increasing cost and decreasing profitability. The lack of proper financial performance monitoring aggravates the situation. For this reason, devising a financial performance evaluation framework to capture the efficiency of different bus routes of Kolkata becomes order of the day. Here, we have investigated into the daily cost structure of a bus across the routes and identified the significant cost parameters using Multi Linear Regression (MLR) model. Next we have implemented a DEA model and determined the financial efficiency of different routes by taking significant cost parameters as inputs and revenue as output.

Keywords: Public Bus Transport, Performance Measurement, Efficiency, Data Envelopment Analysis, Multi Linear Regression

1. Introduction

An efficient public transport system is instrumental for any country's economic growth and social welfare. Public transport can be defined as the transport services offered to the general public at a fixed charge using different transit services like buses, trains, ferries, and railways. Often public transport is criticized for the inefficiency. The lack of convenience and poor service compel passengers to select private mode of journey. The sky rocketing private transport aggravate problems like pollution, road congestion etc. So designing an effective public transport is an order of the day across the world.

Today's urban life is very much dependent on intra-city bus transport. In India, more than 60% of the passengers use public bus transport on regular basis (Phanikumar and Maitra, 2006). Specially, metropolitan cities like Kolkata, Delhi, Mumbai, and Chennai general public rely on intra city bus service very much for daily travel. In the context of Kolkata, performance of bus transport is affected by increasing cost, lack of inter-agency co-ordination, absence of regular system for performance monitoring, etc. Many a scholars suggest that the financial inefficiency stems from the absence of proper mechanisms to monitor the financial performance of different routes (Agarwal and Singh, 2010).

It motivates us to develop a financial performance evaluation framework to capture the efficiency of different bus routes of Kolkata.

Here, we have considered 18 routes under evaluation. The Data related to the daily cost structure and revenue of a bus along with the passenger concentration is provided by Public Vehicles department, Kolkata. In this paper, at first we have investigated into the daily cost structure of the bus. Using Multi Linear Regression (MLR) model, we have identified the cost parameters which have significant impact on the overall daily cost of a bus. As per our finding, driver wage, conductor wage, fuel cost, Office running cost, Stationary cost tyre cost, and servicing cost are the significant cost components which influence the cost structure. Next, we have employed a data envelopment analysis (DEA) model to measure the financial performance by taking daily revenue of a bus as an output variable and aforementioned driver wage, fuel cost, and servicing cost as input parameters. Finally, we have identified the efficient and inefficient routes based on those performance measures.

This paper is organized as follows. In Section 2, we demonstrate the methodology regarding cost structure analysis and present the significant cost parameters in this specific context. In Section 3, we describe the DEA model